

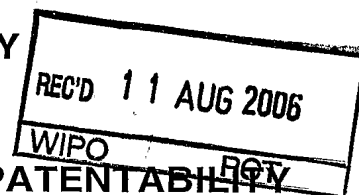
## PATENT COOPERATION TREATY


## PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference R609-PCT	<b>FOR FURTHER ACTION</b>		See Form PCT/PEA/416
International application No. PCT/JP2005/008465	International filing date (day/month/year) 27.04.2005	Priority date (day/month/year) 27.04.2004	
International Patent Classification (IPC) or national classification and IPC INV. B01J37/03 B01D53/94 B01J23/63 B01J23/10			
Applicant TOYOTA JIDOSHA KABUSHIKI KAISHA			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> <i>sent to the applicant and to the International Bureau</i> a total of 2 sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> <i>(sent to the International Bureau only)</i> a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the report</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input checked="" type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand  27.02.2006		Date of completion of this report  10.08.2006	
Name and mailing address of the international preliminary examining authority:   European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016		Authorized officer  Schoofs, B  Telephone No. +31 70 340-2760	



**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/JP2005/008465

**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on

- ☒ the international application in the language in which it was filed
- ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of:
  - ☐ international search (under Rules 12.3(a) and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4(a))
  - ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a))

2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

**Description, Pages**

1-20 as originally filed

**Claims, Numbers**

1-9 filed with telefax on 24.02.2006

**Drawings, Sheets**

1/1 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

\* *If item 4 applies, some or all of these sheets may be marked "superseded."*

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	1-9
	No: Claims	
Inventive step (IS)	Yes: Claims	1-9
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-9
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

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**Box No. VI Certain documents cited**

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1. Certain published documents (Rule 70.10)

and /or

2. Non-written disclosures (Rule 70.9)

**see separate sheet**

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**Box No. VIII Certain observations on the international application**

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The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

1. Reference is made to the following documents:
  - D1: PATENT ABSTRACTS OF JAPAN vol. 016, no. 097 (E-1176), 10 March 1992 (1992-03-10) & JP 03 277060 A (NEC CORP), 9 December 1991 (1991-12-09)
  - D2: PATENT ABSTRACTS OF JAPAN vol. 2003, no. 12, 5 December 2003 (2003-12-05) & JP 2004 074138 A (TOYOTA MOTOR CORP), 11 March 2004 (2004-03-11)
  - D3: EP-A-1 415 956 (TOYOTA MOTOR CO LTD [JP]) 6 May 2004 (2004-05-06)
  - D4: EP-A-1 516 855 (TOYOTA JIDOSHA KABUSHIKI KAISHA) 23 March 2005 (2005-03-23)
  - D5: WO 03/037506 A (MAGNESIUM ELEKTRON LTD; TAKAO, YASUhide; NORMAN, COLIN; EDWARDS, GAVIN) 8 May 2003 (2003-05-08)
2. It appears that the present invention relates to a metal oxide particle comprising
  - a core part comprising a ceria-zirconia solid solution, and
  - a surface layer comprising a second metal oxide, such as ceria or zirconia (claim 1);an exhaust gas purifying catalyst comprising such a metal oxide particle (claims 6-8) and a process for producing such a metal oxide particle (claim 9).
3. Document D5 discloses a metal oxide particle comprising a ceria-zirconia solid solution (D5, examples and claim 1). The presently claimed subject-matter differs from D5 in that D5 does not disclose a particle comprising a core part and a surface layer.
- 3.1 Documents D1 and D2 disclose metal oxide particles comprising a ceria core and a zirconia surface layer (D1, abstract and figure 1) or a zirconia core and ceria surface layer (D2, abstract and figure 1). The presently claimed subject-matter differs from D1 and D2 in that D1 and D2 do not disclose a particle comprising a core part comprising a ceria-zirconia solid solution.

**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

International application No.

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- 3.2 The subject-matter of claims 1-9 is therefore new (Article 33(2) PCT).
4. From the examples of the present application and in particular Table 2, it can be seen that metal oxide particles according to the invention (see examples 1 and 2) provide an improved HC-T50 and OSC compared to particles that do not comprise a core part and a surface layer (see comparative examples 1-6) or particles that do not comprise a core part comprising a ceria-zirconia solid solution (comparative example 7).
- 4.1 The subject-matter of claims 1-9 is therefore based on an inventive step (Article 33(3) PCT).

**Re Item VI**

**Certain documents cited**

**Certain published documents**

Application No Patent No	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
EP-A-1 415 956	06.05.2004	27.10.2003	28.10.2002
EP-A-1 516 855	23.03.2005	16.09.2003	-

**Re Item VIII**

**Certain observations on the international application**

1. It is observed that claims 6, 7 and 8 have been drafted as separate independent claims. It is also noted that an inventive step has to be established not only for ceria and zirconia, but for any listed second metal oxide.

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CLAIMS

1 (Amended). A metal oxide particle comprising a core part and a surface layer,

wherein the molar fraction of cerium and zirconium constituting a ceria-zirconia solid solution in the core part is higher than the molar fraction of the cerium and zirconium constituting a ceria-zirconia solid solution in the surface layer;

wherein the molar fraction of the metal constituting the second metal oxide in the surface layer is higher than the molar fraction of the metal constituting the second metal oxide in the core part; and

wherein the second metal oxide is selected from the group consisting of alumina, zirconia, titania and ceria.

2. The metal oxide particle according to claim 1, wherein said core part and said surface layer each comprises a plurality of primary particles.

3. The metal oxide particle according to claim 1 or 2, wherein said second metal oxide is ceria.

4. The metal oxide particle according to claim 1 or 2, wherein said second metal oxide is zirconia.

5. The metal oxide particle according to claim 3 or 4, wherein said surface layer further comprises an oxide of at least one metal selected from the group consisting of alkaline earth metals and rare earths.

6. An exhaust gas purifying catalyst comprising a noble metal supported on the metal oxide particle according to any one of claims 1 to 5.

7. An exhaust gas purifying catalyst comprising platinum supported on the metal oxide particle according to claim 3.

8. An exhaust gas purifying catalyst comprising rhodium supported on the metal oxide particle according to claim 4.

9 (Amended). A process for producing the metal oxide particle according to claim 1, the process comprising:

providing a sol containing at least a population of ceria-zirconia solid solution colloid particles and a population of second metal oxide colloid particles differing in the isoelectric point with each other,

adjusting the pH of said sol to be closer to the isoelectric point of said population of ceria-zirconia solid solution colloid particles than to the isoelectric point of said population of second metal oxide colloid particles, thereby aggregating said population of ceria-zirconia solid solution colloid particles,

adjusting the pH of said sol to be closer to the isoelectric point of said population of second metal oxide colloid particles than to the isoelectric point of said population of ceria-zirconia solid solution colloid particles, thereby aggregating said population of second metal oxide colloid particles onto said population of ceria-zirconia solid solution colloid particles aggregated, and

drying and firing the obtained aggregate.